

# 20: CLT-based Confidence Intervals for Means

Stat 120 | Fall 2025

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1. (Adapted from Exercise 6.128)

Plastic microparticles contaminate shorelines. Much of the pollution comes from washing fleece clothing. In a recent study, washing a fleece garment discharged on average  $\bar{X} = 290$  fibers per liter of wastewater. The standard deviation was  $s = 87.6$  fibers and the sample size was  $n = 120$ .

- (a) What is the estimated *standard error* of the average number of fibers discharged per liter of wastewater when washing a fleece garment?
- (b) The table below gives some percentiles of the  $t_{119}$  distribution. Use this information to construct a 99% confidence interval for the population mean. Interpret the interval in context.

| percentage | percentile ( <code>qnorm(percentage)</code> ) |
|------------|---|
| 90%        | 1.3   |
| 95%        | 1.6   |
| 97.5%      | 2.0   |
| 99%        | 2.3   |
| 99.5%      | 2.6   |

- (c) What sample size would we need if we wanted this interval to be *no wider* than 20?